Claim 50. (Amended) A hydrogenerator plant for direct connection to a high voltage transmission or distribution network comprising: at least one rotating electric machine for high voltage coupled to a turbine via shaft means, said electric machine [comprising] including at least one winding comprising a conductor and a magnetically permeable, electric field confining insulating covering surrounding the conductor, said conductor including at least one of a plurality of insulated conductive elements, and at least one uninsulated conductive element; [a solid insulation covering surrounding the conductors and in electrical contact with the uninsulated element] and said at least one winding being directly connectable to the transmission or distribution network.

REMARKS

This Amendment is in response to the Official Action of November 5, 1999, wherein the Examiner objected to certain claims for technical reasons. In particular, the Examiner objected to claim 33, as being in improper dependent form. The claim has been amended in order to specify the construction of the machine forming a component of the plant.

Claims 24 and 25 deal with different systems and are believed to thereby provide additional structure. Claim 24 recites a single machine without a transformer and claim 35 recites multiple machines with a system transformer.

The Examiner objected to the term "electrical contact" with respect to the contact between the conductor and the covering. It is believed the term is correctly included in the claim as amended inasmuch as the uninsulated strand may be in electrical contact with the electric field confining insulating covering. It is submitted that the electrical field confining feature of the covering is enhanced by electrical contact with the insulated strand.

For the Examiner's convenience, all of the claims pending in the application have been retyped in this Amendment. Claims which have been canceled are noted. The Examiner's rejection of the claims is respectfully traversed for the reasons set forth below.

In the prior Office Action, the Applicants argued that Elton fails to suggest or teach the use of the cable dynamoelectric machine. Applicants are aware of the Abstract in Elton '165. However, notwithstanding the Examiner's assertion, Elton does not teach or suggest that the cable disclosed in Elton '165 could be the winding of the machine.

Further, Elton does not teach that a power cable for transmission and distribution of electricity could be the winding of a machine. The Abstract in Elton says "The insulated conductor may be windings of a dynamoelectric machine." The Abstract of Elton '165 is not directed to the cable embodiment, but is leftover Abstract from a prior application. Likewise, the Background does not even remotely suggest a correlation between machine and power cable. The Elton '165 patent relates to power cables and does not suggest that power cables having a pyrolized glass layer could be a substitute for rigid conductors in a machine made with pyrolized grounding tape.

Elton '165 describes a high voltage cable having an inner layer of semi-conducting pyrolyzed glass fiber material and an outer layer of the same material in which the outer layer is grounded. Once the teaching of Elton is fully considered and viewed as a whole, it will be apparent that Elton does not show or suggest the invention alone or in combination with any of the references cited. Even though it is suggested in Elton to apply a semi-conducting layer in the form of a pyrolyzed glass tape to a winding in a dynamo-electric machine, and to apply such a layer in a power cable, there is no indication that the use of such a cable would be useful in a dynamo- electric machine. Indeed, the disclosure of Elton '165 stems from a parent U.S. Patent 4,835,565 which describes three different applications for a semi-conducting layer. One application is for using a pyrolyzed glass tape in a layer in conventional winding or armature bars in a known high current, low voltage dynamoelectric machine. A second application set forth in the parent of Elton '165 is for a housing to reduce electric discharge in an enclosed circuit. Finally, the parent of Elton '165 employs a semi-conducting pyrolyzed glass layer in a conventional cable. However, there is no proposal to use the cable shown in Elton '165 in a dynamo-electric machine. It is only the semi-conducting tape that is

used in a dynamo-electric machine. The arrangement of Elton does not provide a solid insulating system as described and disclosed in the present invention

The bar forming the conductor in Elton '565 has square corners, as a result, the field is highly concentrated in the corners and would not be equalized, but would exhibit peaks in these regions. In order to truly equalize the potential in the arrangement of Elton '565 using rectangular conductors, one would have to provide a thick layer of the pyrolized glass material and add other features rendering the design impractical for a machine. Also Elton '565 is not a high voltage arrangement, because high voltage in machines is different than high voltage in the power transmission and distribution context.

It is clear that Elton describes the use of a semi-conducting layer as a grounding tape around conventional insulated electrical windings or armature bars which are disposed in the slots of a conventional machine. Elton '565 discusses the use of an insulated conductor in the winding of a dynamo-electric machine. The conductor is a conventional rigid bar, not a cable.

The Abstract of Elton '165 is identical to the Abstract of the parent, Elton '165, which discloses the three different and diverse applications for semi-conducting pyrolyzed glass fiber. Nowhere does the parent Elton et al. suggest that the cable described in the specification could be used for such purpose. Indeed, Elton '165 discusses the conventional winding in the background but does not in the background. It is only later in Elton '165 that a high-voltage cable is described, and without suggesting that the cable could be used as the winding in the dynamo-electric machine.

In view of the differences in operation and applications between conventional armature windings that use pyrolyzed glass tape and a power cable that also uses pyrolyzed glass tape, one of ordinary skill in the power generation art would not have been motivated at the time the invention was made to substitute the power cable for the winding since the prevailing thought at the time was that cable wound electric machines would not operate successfully at high voltage. Furthermore, Elton itself does not teach or suggest the substitution but merely provides yet another indication that those of ordinary skill in the power

industry would recognize windings as being in a different field of endeavor than power cables. Elton merely describes that the pyroyzed glass tape may be used in these two different fields of endeavor, namely, windings in electric machines and also in power cables. It does not suggest that a winding for a machine and a high voltage cable are interchangeable. Thus, it is believed that Elton '165 has no applicability to the arrangement described in the present invention.

There is no suggestion that the conventional winding of Elton '565 having a semiconducting grounding tape could be modified by substitution of the cable of the invention. The reference simply employs semi-conductive material in conventional machine winding and in a cable structure. Elton '165 does not disclose that it would be useful to use the cable as the winding. This is because, for a given power level P=E·I, where P=power, E=voltage, and I=current, when the voltage is high the voltage is consequently low and vice-versa. As such, the conductor in a high voltage machine according to the invention can be flexible and have a relatively small cross section (as in a cable). Such conductor need not have a capability of carrying a high current. In a conventional high power machine in which current is high and the voltage is relatively low, the conductors are formed of shaped, rigid, high cross-sectional area copper bars. The problems associated with high current operation typically involve thermal considerations, whereas at high voltage, insulation breakdown is a predominant failure mode.

Thus, it is not obvious to combine an essentially high voltage device, such as a power cable in a high current device, such as a high power machine. It is not merely the fact that the voltage in one machine is much higher than the other, it is that the problems associated with high voltage operation are entirely different from problems associated with high current operation, and the focus of the designer is thus entirely different.

Takaoka is simply a conventional cable. Takaoka simply discloses a power cable construction and more particularly, a large size conductor for large capacity having good characteristics in the skin effect coefficient, the withstanding voltage and the minimum winding ratio. According to Takaoka, the purpose of the oxide coating is to increase power transmission capability by

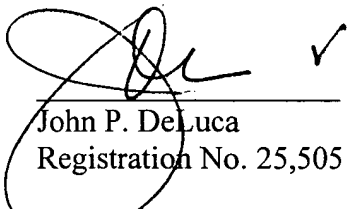
Obviously, this comes into effect over large distances. In the present invention, the length of the cable winding is not so large that such an effect would necessarily be a problem. According to one embodiment in high voltage, high magnetic flux machines, the conductors may be insulated from each other in order to reduce eddy current losses between the conductors. However, it is not absolutely necessary for the individual strands to be mutually insulated. Likewise, it has been found that when at least one of the conductors is uninsulated and in electrical contact with the covering, a predictable equipotential surface is formed adjacent to and surrounds the conductor.

In summary, none of the cited references, either alone or in combination, show an arrangement which does not suffer from at least one important defect, namely: the inability to confine the electric field; unacceptable field peaks; unacceptable heat concentration, i.e., high cooling demand; excessive eddy currents; and too high or too low a resisitivity of the inner and outer layers.

The claims, as amended, are believed to be fully distinguished over the art of record.

It is therefore respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited.

Respectfully submitted,



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